AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Cancelled).

2. (Currently amended) [[The]] A composition comprising a plurality of alkyl zinc compounds and a group 3-10 transition metal complex or a lanthanide or actinide complex, and optionally an activator ~~of claim 1~~, wherein the mole ratio of the complex ~~in the catalyst system~~ to the plurality of zinc alkyl ~~compound~~ compounds in the composition is in the range of from about 1:10,000,000 to 1:100 and wherein the alkyl groups of the plurality of zinc alkyl compounds follow a Poisson statistical distribution of chain lengths up to about 200 carbon atoms or a Schulz-Flory statistical distribution of chain lengths up to about 50,000 carbon atoms.

3. (Previously presented) A process for the preparation of primary alcohols, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex or a group 3 main group metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by oxidation of the zinc alkyl chain growth product to form alkoxide compounds, followed by hydrolysis of the alkoxides compounds to produce primary alcohols.

4 - 7. (Cancelled).

8. (Currently amended) The composition of claim [[1 or]]2, wherein the complex ~~chain growth catalyst system~~ comprises a metallocene catalyst, which contains at least one cyclopentadienyl-based ring ligand.

9. (Previously presented) The composition of claim 8, wherein the metallocene catalyst is represented by the general formula $(C_p)_m MR_nR'_p$ wherein at least one C_p is selected from an unsubstituted or substituted cyclopentadienyl ring, an indenyl moiety, a benzindenyl moiety, a fluorenyl moiety, and any other ligand capable of 0-5 bonding; M is selected from a Group 4, 5 or 6 transition metal, a lanthanide or an actinide; R and R' are independently selected from the group consisting of halogen, a hydrocarbyl group, and a hydrocarboxyl group having 1-20 carbon atoms or combinations thereof; and m=1-3, n=0-3, p=0-3, and the sum of m+n+p equals the oxidation state of M.

10. (Previously presented) The composition of claim 8, wherein the metallocene catalyst is selected from the formulas:

$(C_5R'_m)_p R''_s (C_5R'_m) M^* Q_{3-p-x}$, and

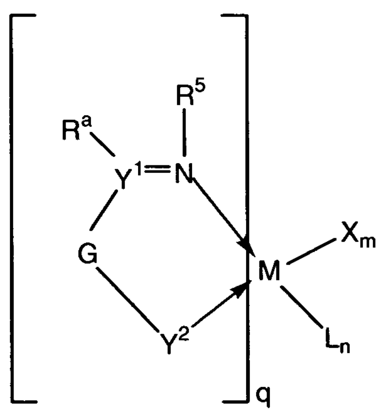
$R''_s (C_5R'_m)_2 M^* Q'$

wherein M* is a Group 4, 5 or 6 transition metal, a lanthanide or an actinide; at least one $C_5R'_m$ is a substituted cyclopentadienyl; each R', which can be the same or different is hydrogen, or an alkyl, alkenyl, aryl, alkylaryl or arylalkyl radical having up to 20 carbon atoms or two carbon atoms joined together to form a part of a substituted or unsubstituted ring or rings having 4 to 20 carbon atoms; R" is at least one C-, Ge-, Si-, P- or N-containing radical either bridging two $(C_5R'_m)$ rings or bridging one $(C_5R'_m)$ ring and M*; each Q, which can be the same or different, is selected from the group consisting of an aryl, alkyl, alkenyl, alkylaryl, or arylalkyl radical having up to 20 carbon atoms, halogen, or alkoxides; Q' is an alkylidene radical having up to 20 carbon atoms;

s is 0 or 1 and when s is 0, m is 5 and p is 0, 1 or 2, and when s is 1, m is 4 and p is 1; when p=0, x=1 otherwise "x" is always equal to 0.

11. (Previously presented) The composition of claim 8, wherein the metallocene catalyst is selected from the group consisting of bis(pentamethylcyclopentadienyl) zirconium dichloride, bis(pentamethylcyclopentadienyl) hafnium dichloride, bis(tetramethylcyclopentadienyl) zirconium dichloride, (pentamethylcyclopentadienyl) zirconium trichloride, (tetramethylcyclopentadienyl)(t-butylamido)(dimethylsilane) titanium dimethyl, and (pentamethylcyclopentadienyl)(cyclopentadienyl) zirconium dichloride.

12. (Currently amended) The composition of claim [[1 or]]2, wherein the ~~chain growth catalyst system comprises a~~ complex [[of]] has the Formula (I):

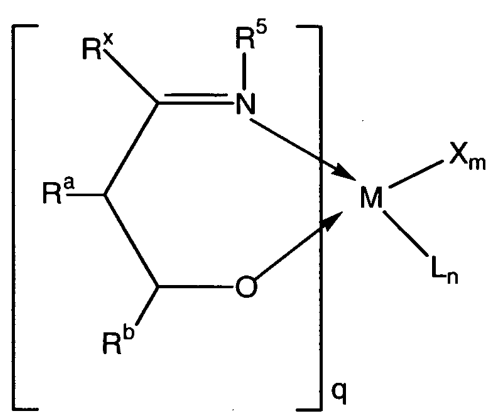


Formula (I)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; Y^1 is C or $P(R^c)$; Y^2 is $-O(R^7)$, -O (in which case the bond from O to

M is covalent), $-C(R^b)=O$, $-C(R^b)=N(R^7)$, $-P(R^b)(R^d)=N(R^7)$ or $-P(R^b)(R^d)=O$; R^a, R^b, R^c, R^d, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^c, R^d, R^5 and R^7 may be joined together to form a ring; G is a direct bond between Y^1 and Y^2, L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

13. (Currently amended) The composition of claim [[1 or]]2, wherein the ~~chain growth catalyst system comprises a~~ complex [[of]] <u>has</u> the ~~formula~~ <u>Formula</u> (II):

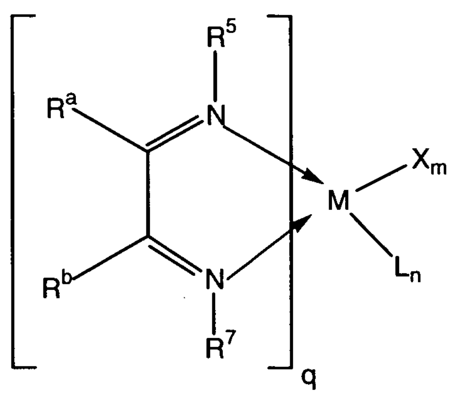


Formula (II)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^x, and R^5 are each independently selected from the group

consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R' is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^x, and R^5 may be joined together to form a ring; L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

14. (Currently amended) The composition of claim [[1 or]]2, wherein the ~~chain growth catalyst system comprises a~~ complex [[of]] has the Formula (III):

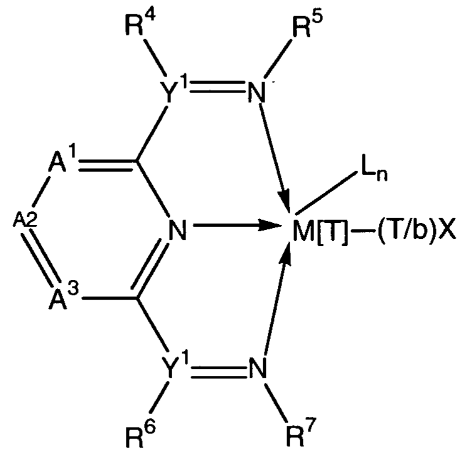


Formula (III)

wherein M is Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], Cu[I], Cu[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R' is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted

heterohydrocarbyl, and R^a and R^b may be joined together to form a ring; and L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

15. (Currently amended) The composition of claim [[1 or]]2, wherein the ~~chain growth catalyst system comprises a~~ complex [[of]] has the Formula (IV):

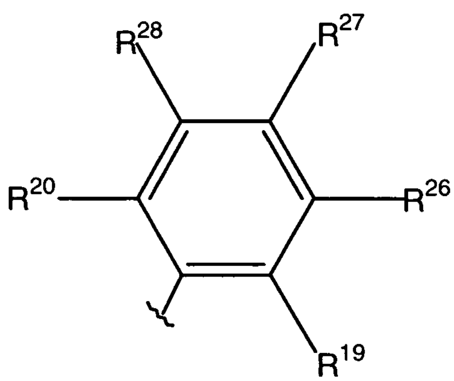


Formula (IV)

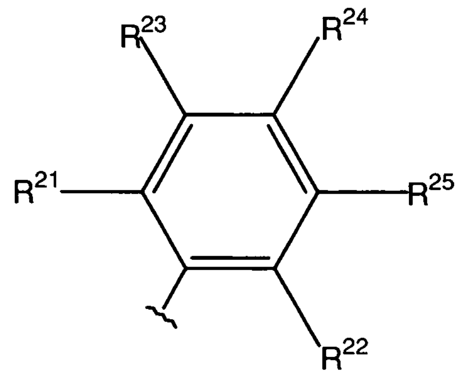
wherein M[T] is Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; T is the oxidation state of the transition metal M and b is the valency of the atom or group X; Y^1 is C or $P(R^c)$, A^1 to A^3 are each independently N or P or CR, with the proviso that at least one is CR; and R, R^c, R^4, R^5, R^6 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl.

16. (Previously presented) The composition of claim 15, wherein Y^1 is C, and A^1 to A^3 are each CR, or A^1 and A^3 are both N and A^2 is CR, or one of A^1 to A^3 is N and the others are CR.

17. (Previously presented) The composition of claim 15, wherein Y^1 is C, A^1 to A^3 are each CR, and R^5 is represented by the group "P" and R^7 is represented by the group "Q" as follows:



Group P



Group Q

wherein R^{19} to R^{28} are independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl; and when any two or more of R^4, R^6 and R^{19} to R^{28} are hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl or substituted heterohydrocarbyl, said two or more can be linked to form one or more cyclic substituents.

18. (Currently amended) The composition of claim [[1 or]]2, wherein the ~~chain growth catalyst system~~ complex is 2,6-diacetylpyridinebis(2,4,6 trimethyl anil)$FeCl_2$ or 2,6-diacetylpyridinebis(2, 6 diisopropyl anil)$FeCl_2$.

19. (Currently amended) The composition of claim [[1 or]]2, wherein the activator ~~for the chain growth catalyst system~~ is selected from organoaluminium compounds and hydrocarbylboron compounds.

20 - 23.(Cancelled).

24. (Currently amended) The composition of claim [[1 or]]2, wherein the mole ratio is from about 1:1,000,000 to 1:100.

25. (Currently amended) The composition of claim [[1 or]]2, wherein the mole ratio is from about 1:500,000 to 1:200.

26. (Previously presented) The process of claim 3, wherein the zinc alkyl compound is a species or mixture of species containing a R'R"CH-Zn or R'R"C-Zn moiety, wherein R' and R" are independently selected from the group consisting of hydrogen, hydrocarbyl, silyl, and substituted hydrocarbyl, and may be linked to form a cyclic species, subject to the proviso that in the case of R'R"C-Zn, the C bonded to the Zn is unsaturated.

27. (Previously presented) The process of claim 3, wherein the zinc alkyl compound has the formula R_mZnH_n, where m is 1 or 2 and n is 0 or 1, m+n=2, and each R is independently C_1 to C_{30} alkyl.

28. (Previously presented) The process of claim 3, wherein the zinc alkyl compound is selected from the group consisting of dimethylzinc, diethylzinc, di-n-butylzinc, di-n-hexylzinc, dibenzylzinc, di-n-decylzinc, di-n-dodecylzinc, di-phenyl-Zn and $(C_5H_5)ZnEt$.

29. (Previously presented) The process of claim 3, wherein the alpha-olefin is selected from C_2 to C_{16} linear alpha-olefins.

30. (Previously presented) The process of claim 3, wherein the chain growth catalyst system comprises a metallocene catalyst, which contains at least one cyclopentadienyl-based ring ligand.

31. (Previously presented) The process of claim 30, wherein the metallocene catalyst is represented by the general formula $(C_p)_m MR_nR'_p$ wherein at least one C_p is selected from an unsubstituted or substituted cyclopentadienyl ring, an indenyl moiety, a benzindenyl moiety, a fluorenyl moiety, and any other ligand capable of 0-5 bonding; M is selected from a Group 4, 5 or 6 transition metal, a lanthanide or an actinide; R and R' are independently selected from the group consisting of halogen, a hydrocarbyl group, and a hydrocarboxyl group having 1-20 carbon atoms or combinations thereof; and m=1-3, n=0-3, p=0-3, and the sum of m+n+p equals the oxidation state of M.

32. (Previously presented) The process of claim 30, wherein the metallocene catalyst is selected from the formulas:

$(C_5R'_m)_p R''_s (C_5R'_m) M^* Q_{3-p-x}$, and

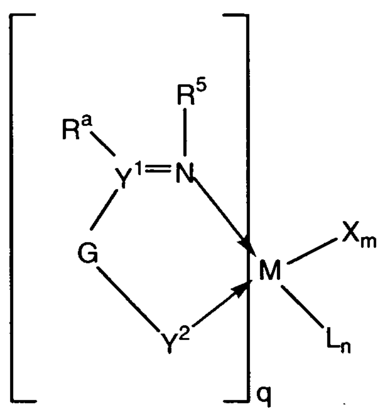
$R''_s (C_5R'_m)_2 M^* Q'$

wherein M* is a Group 4, 5 or 6 transition metal, a lanthanide or an actinide; at least one $C_5R'_m$ is a substituted cyclopentadienyl; each R', which can be the same or different is hydrogen, or an alkyl, alkenyl, aryl, alkylaryl or arylalkyl radical having ~~from 1~~ up to 20 carbon atoms or two carbon atoms joined together to form a part of a substituted or unsubstituted ring or rings having 4 to 20 carbon atoms; R" is at least one C-, Ge-, Si-, P- or N-containing radical either bridging two $(C_5R'_m)$ rings or bridging one $(C_5R'_m)$ ring and M*; each Q, which can be the same or different, is selected from the group consisting of an aryl, alkyl, alkenyl, alkylaryl, or arylalkyl radical having up to 20 carbon atoms, halogen, or alkoxides; Q' is an alkylidene radical having up to 20 carbon atoms;

s is 0 or 1 and when s is 0, m is 5 and p is 0, 1 or 2, and when s is 1, m is 4 and p is 1; when p=0, x=1 otherwise "x" is always equal to 0.

33. (Previously presented) The process of claim 30, wherein the metallocene catalyst is selected from the group consisting of bis(pentamethylcyclopentadienyl) zirconium dichloride, bis(pentamethylcyclopentadienyl) hafnium dichloride, bis(tetramethylcyclopentadienyl) zirconium dichloride, (pentamethylcyclopentadienyl) zirconium trichloride, (tetramethylcyclopentadienyl)(t-butylamido)(dimethylsilane) titanium dimethyl, and (pentamethylcyclopentadienyl)(cyclopentadienyl) zirconium dichloride.

34. (Previously presented) The process of claim 3, wherein the chain growth catalyst system comprises a complex of the Formula (I):

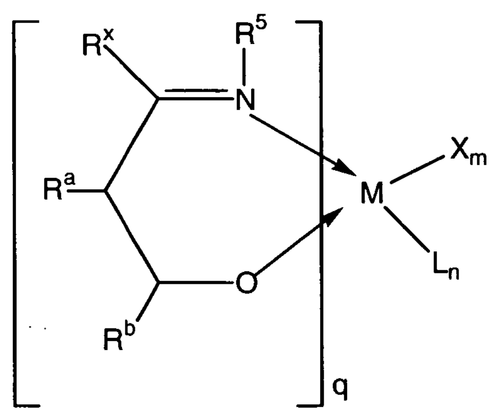


Formula (I)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; Y^1 is C or $P(R^c)$; Y^2 is $-O(R^7)$, -O (in which case the bond from O to

M is covalent), -C(R^b)=O, -C(R^b)=N(R^7), -P(R^b)(R^d)=N(R^7) or -P(R^b)(R^d)=O; R^a, R^b, R^c, R^d, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^c, R^d, R^5 and R^7 may be joined together to form a ring; G is ~~either~~ a direct bond between Y^1 and Y^2, L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

35. (Previously presented) The process of claim 3, wherein the chain growth catalyst system comprises a complex of the formula (II):

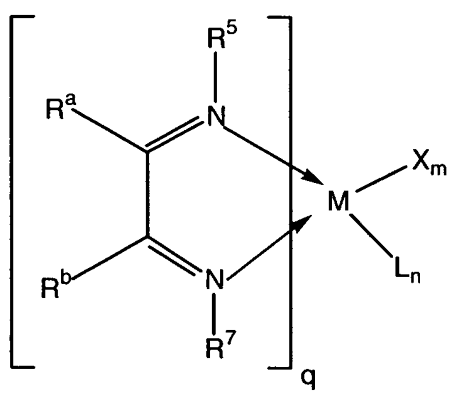


Formula (II)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^x, and R^5 are each independently selected from the group

consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^x, and R^5 may be joined together to form a ring; L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

36. (Previously presented) The process of claim 3, wherein the chain growth catalyst system comprises a complex of the Formula (III):

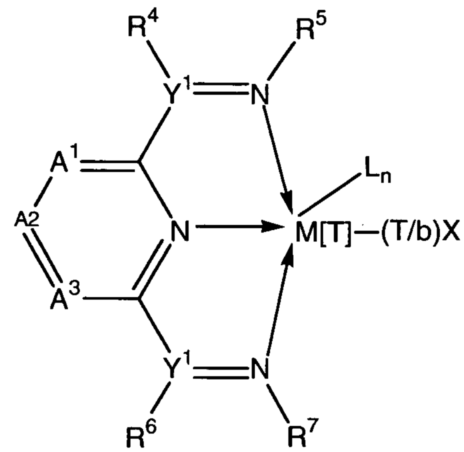


Formula (III)

wherein M is Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], Cu[I], Cu[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted

heterohydrocarbyl, and R^a and R^b may be joined together to form a ring; and L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

37. (Previously presented) The process of claim 3, wherein the chain growth catalyst system comprises a complex of the Formula (IV):

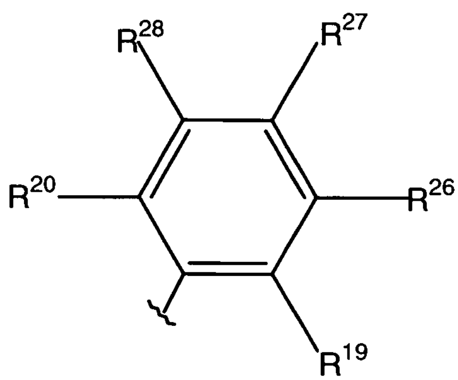


Formula (IV)

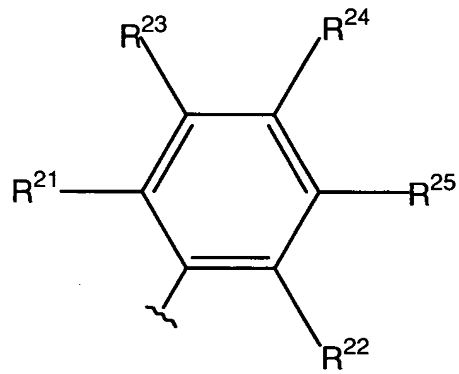
wherein M[T] is Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; T is the oxidation state of the transition metal M and b is the valency of the atom or group X; Y^1 is C or $P(R^c)$, A^1 to A^3 are each independently N or P or CR, with the proviso that at least one is CR; and R, R^c, R^4, R^5, R^6 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl.

38. (Previously presented) The process of claim 37, wherein Y^1 is C, and A^1 to A^3 are each CR, or A^1 and A^3 are both N and A^2 is CR, or one of A^1 to A^3 is N and the others are CR.

39. (Previously presented) The process of claim 37, wherein Y^1 is C, A^1 to A^3 are each CR, and R^5 is represented by the group "P" and R^7 is represented by the group "Q" as follows:



Group P



Group Q

wherein R^{19} to R^{28} are independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl; and when any two or more of R^4, R^6 and R^{19} to R^{28} are hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl or substituted heterohydrocarbyl, said two or more can be linked to form one or more cyclic substituents.

40. (Previously presented) The process of claim 3, wherein the chain growth catalyst system is 2,6-diacetylpyridinebis(2,4,6 trimethyl anil)$FeCl_2$ or 2,6-diacetylpyridinebis(2, 6 diisopropyl anil)$FeCl_2$.

41. (Previously presented) The process of claim 3, wherein the activator for the chain growth catalyst system is selected from organoaluminium compounds and hydrocarbylboron compounds.

42. (Previously presented) The process of claim 3, including a neat zinc alkyl medium or a hydrocarbon solvent diluent.

43. (Previously presented) The process of claim 3, wherein the catalyst system is activated by incubation in an aluminoxane solution for about 5 minutes at 20°C prior to addition of the zinc alkyl compound.

44. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product is carried out using a Ni catalyst.

45. (Previously presented) The process of claim 44, wherein the Ni catalyst is selected from the group consisting of $Ni(acac)_2$ and nickel napthenate.

46. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the

zinc alkyl compound is a species or mixture of species containing a R'R"CH-Zn or R'R"C-Zn moiety, wherein R' and R" are independently selected from the group consisting of hydrogen, hydrocarbyl, silyl, and substituted hydrocarbyl, and may be linked to form a cyclic species, subject to the proviso that in the case of R'R"C-Zn, the C bonded to the Zn is unsaturated.

47. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the zinc alkyl compound is a species or mixture of species containing a R'R"CH-Zn or R'R"C-Zn moiety, wherein R' and R" are independently selected from the group consisting of hydrogen, hydrocarbyl, silyl, and substituted hydrocarbyl, and may be linked to form a cyclic species, subject to the proviso that in the case of R'R"C-Zn, the C bonded to the Zn is unsaturated.

48. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc

alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a metallocene catalyst, which contains at least one cyclopentadienyl-based ring ligand.

49. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a metallocene catalyst, which contains at least one cyclopentadienyl-based ring ligand.

50. (Previously presented) The process of claim 48 or 49, wherein the metallocene catalyst is represented by the general formula $(C_p)_m MR_nR'_p$ wherein at least one C_p is selected from an unsubstituted or substituted cyclopentadienyl ring, an indenyl moiety, a benzindenyl moiety, a fluorenyl moiety, and any other ligand capable of 0-5 bonding; M is selected from a Group 4, 5 or 6 transition metal, a lanthanide or an actinide; R and R' are independently selected from the group consisting of halogen, a hydrocarbyl group, and a hydrocarboxyl group having 1-20 carbon atoms or combinations thereof; and m=1-3, n=0-3, p=0-3, and the sum of m+n+p equals the oxidation state of M.

51. (Previously presented) The process of claim 48 or 49, wherein the metallocene catalyst is selected from the formulas:

$(C_5R'_m)_p R''_s (C_5R'_m) M^* Q_{3-p-x}$, and

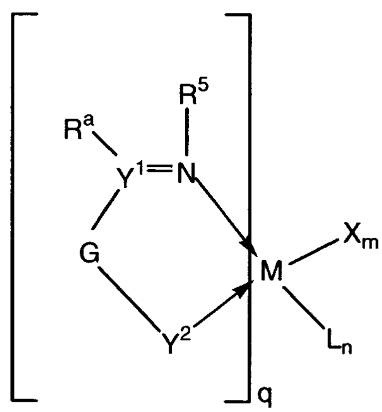
$R''_s (C_5R'_m)_2 M^* Q'$

wherein M* is a Group 4, 5 or 6 transition metal, a lanthanide or an actinide; at least one $C_5R'_m$ is a substituted cyclopentadienyl; each R', which can be the same or different is hydrogen, or an alkyl, alkenyl, aryl, alkylaryl or arylalkyl radical having up to 20 carbon atoms or two carbon atoms joined together to form a part of a substituted or unsubstituted ring or rings having 4 to 20 carbon atoms; R" is at least one C-, Ge-, Si-, P- or N-containing radical either bridging two $(C_5R'_m)$ rings or bridging one $(C_5R'_m)$ ring and M*; each Q, which can be the same or different, is selected from the group consisting of an aryl, alkyl, alkenyl, alkylaryl, or arylalkyl radical having up to 20 carbon atoms, halogen, or alkoxides; Q' is an alkylidene radical having up to 20 carbon atoms; s is 0 or 1 and when s is 0, m is 5 and p is 0, 1 or 2, and when s is 1, m is 4 and p is 1; when p=0, x=1 otherwise "x" is always equal to 0.

52. (Previously presented) The process of claim 48 or 49, wherein the metallocene catalyst is selected from the group consisting of bis(pentamethylcyclopentadienyl) zirconium dichloride, bis(pentamethylcyclopentadienyl) hafnium dichloride, bis(tetramethylcyclopentadienyl) zirconium dichloride, (pentamethylcyclopentadienyl) zirconium trichloride, (tetramethylcyclopentadienyl)(t-butylamido)(dimethylsilane) titanium dimethyl, and (pentamethylcyclopentadienyl)(cyclopentadienyl) zirconium dichloride.

53. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a

chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (I):

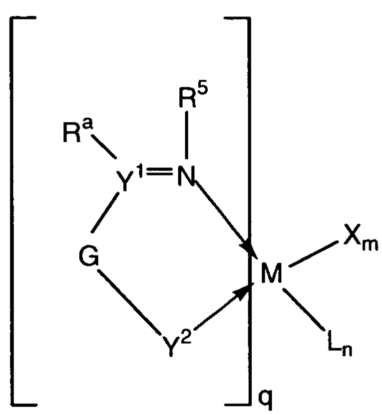


Formula (I)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; Y^1 is C or $P(R^c)$; Y^2 is $-O(R^7)$, -O (in which case the bond from O to M is covalent), $-C(R^b)=O$, $-C(R^b)=N(R^7)$, $-P(R^b)(R^d)=N(R^7)$ or $-P(R^b)(R^d)=O$; R^a, R^b, R^c, R^d, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group,

a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^c, R^d, R^5 and R^7 may be joined together to form a ring; G is a direct bond between Y^1 and Y^2, L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

54. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (I):

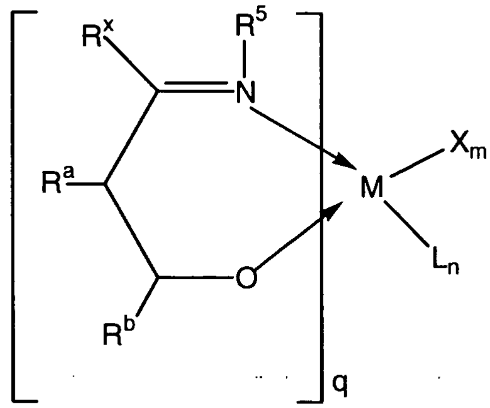


Formula (I)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III],

Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; Y^1 is C or $P(R^c)$; Y^2 is $-O(R^7)$, -O (in which case the bond from O to M is covalent), $-C(R^b)=O$, $-C(R^b)=N(R^7)$, $-P(R^b)(R^d)=N(R^7)$ or $-P(R^b)(R^d)=O$; R^a, R^b, R^c, R^d, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R' is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^c, R^d, R^5 and R^7 may be joined together to form a ring; G is a direct bond between Y^1 and Y^2, L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

55. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (II):

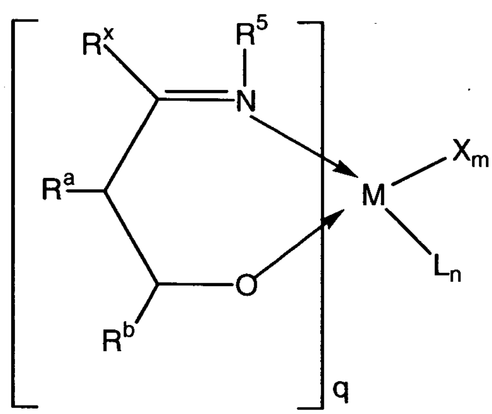


Formula (II)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^x, and R^5 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^x, and R^5 may be joined together to form a ring; L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

56. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth

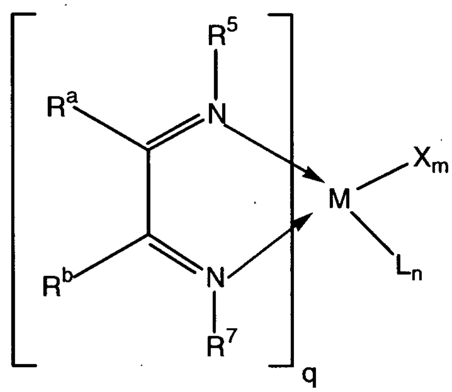
product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (II):



Formula (II)

wherein M is Y[II], Y[III], Sc[II], Sc[III], Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^x, and R^5 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, a hydrocarbyl group, a substituted hydrocarbyl group, a heterohydrocarbyl group and a substituted heterohydrocarbyl group, and adjacent ones of R^a, R^b, R^x, and R^5 may be joined together to form a ring; L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

57. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (III):

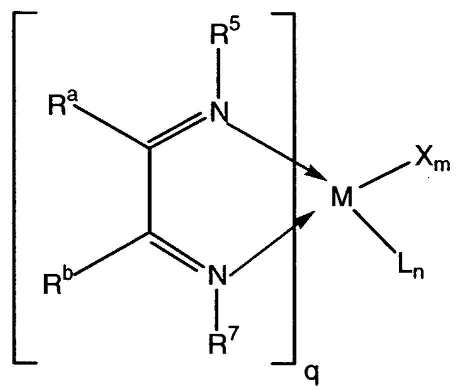


Formula (III)

wherein M is Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], Cu[I], Cu[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted

heterohydrocarbyl, and R^a and R^b may be joined together to form a ring; and L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

58. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (III):

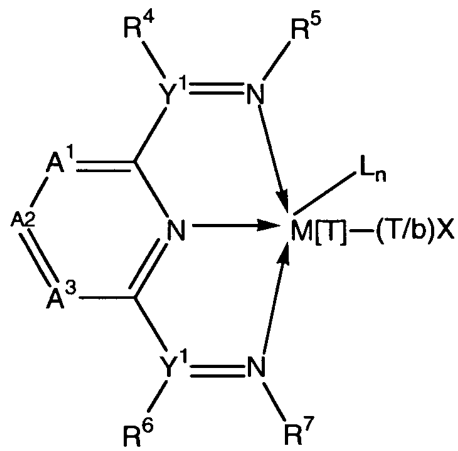


Formula (III)

wherein M is Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II], Cu[I], Cu[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; R^a, R^b, R^5 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R′ is independently selected from the group consisting of hydrogen,

halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl, and R^a and R^b may be joined together to form a ring; and L is a group datively bound to M; n is from 0 to 5; m is 1 to 3 and q is 1 or 2.

59. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (IV):

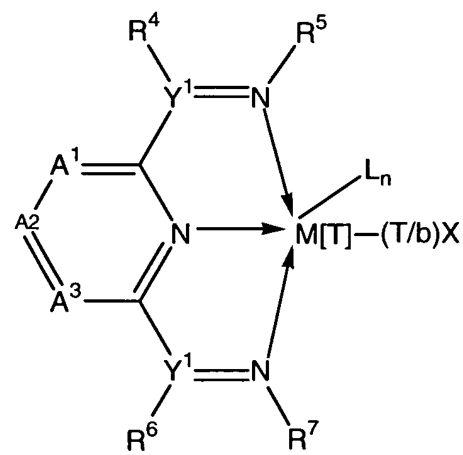


Formula (IV)

wherein M[T] is Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III], Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; T is the oxidation state of the transition metal M and b is the valency of the atom or group

X; Y^1 is C or $P(R^c)$, A^1 to A^3 are each independently N or P or CR, with the proviso that at least one is CR; and R, R^c, R^4, R^5, R^6 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R' is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl.

60. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system comprises a complex of the Formula (IV):



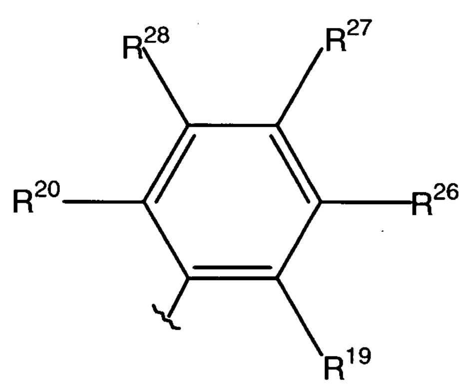
Formula (IV)

wherein M[T] is Ti[II], Ti[III], Ti[IV], Zr[II], Zr[III], Zr[IV], Hf[II], Hf[III], Hf[IV], V[II], V[III], V[IV], Nb[II], Nb[III], Nb[IV], Nb[V], Ta[II], Ta[III], Ta[IV], Cr[II], Cr[III], Mn[II], Mn[III],

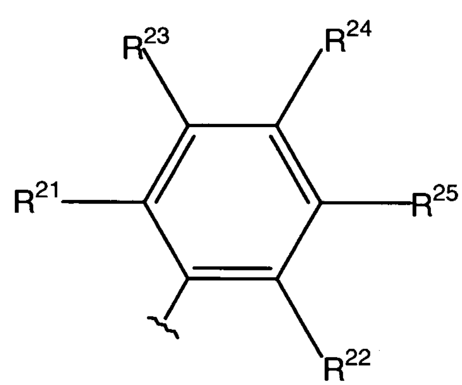
Mn[IV], Fe[II], Fe[III], Ru[II], Ru[III], Ru[IV], Co[II], Co[III], Rh[II], Rh[III], Ni[II], Pd[II]; X represents an atom or group covalently or ionically bonded to the transition metal M; T is the oxidation state of the transition metal M and b is the valency of the atom or group X; Y^1 is C or $P(R^c)$, A^1 to A^3 are each independently N or P or CR, with the proviso that at least one is CR; and R, R^c, R^4, R^5, R^6 and R^7 are each independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl, substituted heterohydrocarbyl and SiR'_3 where each R' is independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted heterohydrocarbyl.

61. (Previously presented) The process of claim 59 or 60, wherein Y^1 is C, and A^1 to A^3 are each CR, or A^1 and A^3 are both N and A^2 is CR, or one of A^1 to A^3 is N and the others are CR.

62. (Previously presented) The process of claim 59 or 60, wherein Y^1 is C, A^1 to A^3 are each CR, and R^5 is represented by the group "P" and R^7 is represented by the group "Q" as follows:



Group P



Group Q

wherein R^{19} to R^{28} are independently selected from the group consisting of hydrogen, halogen, hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl and substituted

heterohydrocarbyl; and when any two or more of R^4, R^6 and R^{19} to R^{28} are hydrocarbyl, substituted hydrocarbyl, heterohydrocarbyl or substituted heterohydrocarbyl, said two or more can be linked to form one or more cyclic substituents.

63. (Previously presented) A process for the preparation of zinc alkyl chain growth products via a catalysed chain growth reaction of an alpha-olefin on a zinc alkyl compound, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system is 2,6-diacetylpyridinebis(2,4,6 trimethyl anil)$FeCl_2$ or 2,6-diacetylpyridinebis(2, 6 diisopropyl anil)$FeCl_2$.

64. (Previously presented) A process for the preparation of alpha-olefins, comprising contacting an alpha-olefin and a zinc alkyl compound with a chain growth catalyst system which employs a group 3-10 transition metal complex, or a lanthanide or actinide complex, and optionally an activator to form a zinc alkyl chain growth product, followed by olefin displacement of the grown alkyls as alpha-olefins from the zinc alkyl chain growth product, wherein the mole ratio of the complex in the catalyst system to the zinc alkyl compound is in the range of from about 1:10,000,000 to 1:100, and wherein the chain growth catalyst system is 2,6-diacetylpyridinebis(2,4,6 trimethyl anil)$FeCl_2$ or 2,6-diacetylpyridinebis(2, 6 diisopropyl anil)$FeCl_2$.